

Jacobs Pineda, Inc.

Office of the Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

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August 5, 1996

RE: MM Docket No. 87-268

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Dear Sirs:

Pursuant to applicable procedures set forth in Sections 1.415 and 1.419 of the Commission's Rules, 47C.F.R. Sections 1.415 and 1.419, Jacobs Pineda, Inc. wishes to formally file reply comments at this time.

Enclosed please find one original and eleven copies to be distributed to each of the Commissioners.

Sincerely,



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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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AUG 8 1996
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In the Matter of)
)
Advanced Television Systems)
and Their Impact Upon the)
Existing Television Broadcast)
Service)

MM Docket No. 87-268

Fifth Further Notice of)
Proposed Rule Making)

original

REPLY COMMENTS OF JACOBS PINEDA, INC

Jacobs Pineda, Inc. ("JPI") respectfully submits these reply comments on the Commission's Fifth Further Notice of Proposed Rule Making ("NPRM") adopted on May 9, 1996 and released on May 20, 1996 by the Federal Communications Commission in its Advanced Television ("ATV") proceeding.

In its NPRM, the Commission proposed adoption of the ATSC Digital Television Standard which would require the use by digital television licensees of each element of the standard. The proposed adoption and comments by parties filed before July 11, 1996 are addressed in these reply comments from JPI.

I. Introduction

The founders of Jacobs Pineda, Inc. have combined experiences in the audio and computer fields totaling over 40 years. Much of the focus of our careers has been on analog and digital audio, and currently we are involved in the design and manufacture of low-cost silicon integrated circuits ("ICs") for consumer digital audio applications such as the proposed ATSC standard for ATV. JPI has extensive experience in the implementation of both MPEG1, 2 and Dolby AC-1, AC-2, and AC-3 audio systems in silicon and extensive expertise with digital compression standards through active participation in ISO/IEC JTC 1 SC29 and ANSI X3L3 standards bodies since 1989.

Because we deal with the economics of the implementations of audio systems for consumer products, and we are experts in the design of signal processing integrated circuits, we feel qualified to file the enclosed reply comments regarding our observations on the demand for, implementation complexity of, and economics of the audio portion of the ATSC DTV Standard. In addition, we specifically address comments filed previously with the FCC¹.

August 4, 1996

¹ Comments of Digital Theatre Systems, LP filed July 10, 1996

II. Demand for ATSC audio based products

As part of our business, we track the demand for audio products. The "home theater" market has greatly expanded due to the proliferation of Pro-Logic surround decoders, which allow Dolby surround-encoded movies to be played at home in a multi-channel format for sound effect approaching that of a movie theater. The low-cost of such surround decoders have made them commonplace, and many people are able to enjoy realistic movie sound tracks as a result.

The increased awareness of such technology has increased the demand for multi-channel sound systems in the home. Pending technologies such as Digital Versatile Disk ("DVD") will also bring multi-channel encoded movies and music into the home, using the same AC-3 coding recommended by the ATSC (document A/52). The AC-3 coding is compatible with existing equipment by allowing downmix to two stereo channels that can be decoded to surround with existing equipment on the market. Given the length of time that the public takes in embracing new technologies, this compatibility with existing equipment is very important.

III. The Availability of Low-Cost Hardware for ATSC elements

There is limited availability of low-cost implementations of elements of the ATSC at this time. This represents a problem for equipment manufacturers and integrated circuit developers, who have not taken steps to reduce costs because of the lack of an approved standard to justify new development. JPI feels that the cost issues are key in the acceptance of new technologies and they threaten the success of all of the hard work devoted to the development of the ATSC DTV audio standard thus far.

IV. The Real Cost of supporting Multiple Audio Coding Standards

In comments previously filed with the FCC, there is a recommendation to eliminate the requirement that digital television licensees use the AC-3 audio coding recommended by ATSC, so that other competing systems may be employed as well. There are definite and measureable cost consequences of doing so.

Most audio coding systems may be implemented on general purpose hardware processors, called DSPs, which may be programmed to do a variety of functions like a computer. When comparing costs for competing audio systems implemented in this way, the differential is usually small, since the same IC hardware may be used for each coding standard (differences would only be the amount of memory required for each standard, and the cost of storing the instructions that tell the DSP how to perform each standard).

The complexity of most contemporary audio coding systems has grown substantially, which is a direct result of achieving the reduction in bandwidth needed to represent the audio content necessary to fit the constraints of the storage or transmission medium. The recommendation of standards is often a hinge by which developers of ICs gauge the potential return on the large investment necessary to develop a new IC to implement any particular coding standard. Hence, the ATSC is a critical part of the path towards making the technology contained within available to consumers at a reasonable cost.

If the ATSC DTV standard were to remove the requirement of digital television licensees to use one audio coding standard, the audio portion of digital televisions would have to be implemented on general purpose downloadable DSP hardware, as stated in comments

previously filed¹. JPI asserts that this will place an additional burden on the cost of the digital television equipment, because such equipment will 1) require downloadable "RAM" memory which is much greater in cost than fixed "ROM" memory, and 2) not be able to take advantage of dedicated hardware optimized for one coding standard. Depending on the wording of the adopted standard, some equipment manufacturers may choose NOT to support all of the audio coding methods allowable with general purpose hardware. This will lead to equipment incompatibilities, and a lack of consistent performance amongst products.

JPI has developed dedicated IC hardware for both MPEG and Dolby AC-3 audio coding systems. Our techniques allow the implementation of such audio coders in much smaller silicon areas than general purpose DSPs. We estimate that the relative cost of a dedicated IC for one particular coding standard is in the range of 1/4 to 1/2 the cost of general purpose hardware. Hence, support for more standards will simply increase the cost of ATSC DTV equipment, and limits its proliferation. While one dedicated circuit can also address multiple audio coding standards, for each set of functionality necessary to support, the cost of the IC increases. Hence it is clearly less expensive to implement a single audio coding standard in digital televisions, rather than supporting multiple standards.

One last point about the economics of a single versus multiple audio coding standard is that because of cost, the multiple coding standard would most likely be implemented on a stand-alone general purpose DSP IC. Dedicated hardware for a single coding standard, such as the type JPI designs, has a very small incremental cost when combined with video decoding functions on a larger IC. . Therefore, by limiting the level of integration of the ATSC DTV system, the requirement for supporting multiple coding standards would be significantly less economical.. By recommending the ATSC DTV standard as it exists currently, IC developers can more rapidly approach the design of single ICs that implement most of the signal processing, making the technology affordable by all.

V. Economics of Patent Licensing

Because JPI designs ICs for audio coding formats like MPEG and AC-3 which require licensing of patent rights, we are familiar with the effects that patent licensing has on the economics of the IC market. We note that uncertainty in patent license availability retards the rate at which ICs for a technology become available. Basically, until a complete patent package is assembled by a patent licensor, companies are reluctant to invest in R&D for products that require patent licenses. The processes is further retarded by the lead time required for pending patents to reach issued status, because until this occurs, there is no assurance that the licensor's pending patent claims will be upheld, and that there will be anything of value to license. Even after the patent package is available, and assuming that the upheld patent claims are sufficiently broad, it takes several years for the market to build momentum for the licensed technology. At this time, we see that there is tremendous momentum in the development of ICs for AC-3 decoding, and we attribute this in part to the maturity and status of the patent package. We recommend that in making its decision, the FCC should consider the maturity and status of the patent package for audio coding, as this will affect the availability of inexpensive ICs to implement the standard.

VI. Mandating the ATSC DTV Standard

The ATSC DTV proposed standard supports the AC-3 coding for its audio programming, making it compatible with other types of equipment such as DVD and home stereos, and satisfying the demands of many home theater enthusiasts.

The NPRM is seeking comments on the "Proposal" (NPRM, 37) to adopt the ATSC DTV Standard and to require the use of each element of the ATSC DTV Standard by digital television licensees. JPI endorses the findings of the ATSC and endorses the Commission's proposal to adopt the ATSC DTV Standard. We feel that extensive independent comparative testing against other coding methods has adequately shown the technical benefits of the audio coding portion of this standard, and we see that there is already a great demand for low-cost version hardware to implement this portion of the standard. Further, the adoption of the standard will allow full scale development of such low cost hardware to proceed at the rate necessary to make digital television equipment affordable to most Americans. Finally, we feel that subtle differences in the coding efficiency and audio quality between competing audio coding standards are far outweighed in importance by the cost issues of equipment implementing the ATSC DTV standard, such that only a well defined and low-cost system will bring the benefits of the new technology to the American public.

VII. U.S. Competitive Aspects

Currently, our implementation for AC-3 audio decoding is one of several American offerings for this portion of the ATSC DTV standard. Because of its excellent feature set, and the lead that American companies have in the technology of low-cost AC-3 implementations, the Commission's decision to adopt and endorse the ATSC DTV Standard in its entirety will enhance the competitiveness of the U.S. in the world markets. Currently, U.S. companies are leaders in the development of dedicated AC-3 hardware. In an open standard, the implementation could potentially utilize DSPs from many other countries in Europe and Japan, and greatly reduce profits for American companies.

VIII. Conclusion

In conclusion, Jacobs Pineda, Inc. respectfully requests the Commission to take action to accept and embrace the work and recommendations of the ACATS, and to mandate the use of the ATSC DTV Standard by broadcast licensees. This would include following the recommendations of the ATSC by mandating the use of all elements of the ATSC DTV Standard, which has been recognized internationally in its ability to provide the highest quality pictures and sound. This would provide the level of certainty needed to justify development investments required to offer the ATSC DTV technology to the average person at a reasonable cost, bolster the credibility of the ATV technology worldwide, and enhance the competitiveness of American companies who are already producing ICs for this system.